




LCD MONITORS



Topics to be covered

- CRT & LCD Monitor History
 - LCDs Advantages & Disadvantages
 - Current LCDs
 - Future Trends
 - Buyer's Guide
- 




CRT & LCD Monitor History

How it all started






Monitor Overview

- The most-used output device on a computer.
 - Most desktop displays use a cathode ray tube (CRT).
 - Laptops use liquid crystal display (LCD), light-emitting diode (LED), and gas plasma or other image projection technology.
 - Monitors using LCD technologies are beginning to replace CRT.
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LCD History

- Liquid crystals were first discovered in 1888 by Austrian botanist Friedrich Reinitzer.
 - Melt cholesterol-like substance.
 - When cooled, the liquid turned blue before finally crystallizing.
 - RCA made the first experimental LCD in (1968).
 - Manufacturers have been developing creative variations and improvements since on LCDs.
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What is Being Used Today?

- The most popular display today remains CRT.
 - It has been available for more than 70 years.
 - CRTs:
 1. Vivid colors and detailed images and text.
 2. Cost less than LCD monitors.
 3. Continue to evolve.
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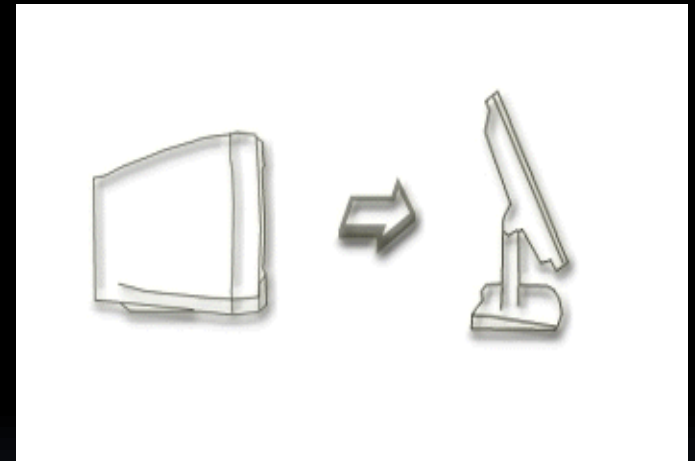


LCD Market Trend

- Market for flat screen LCDs grew rapidly during the '90s.
 - Huge success of the laptop computer.
 - It has still been slow in matching the market share of the CRT.
 - Color LCDs hit the market in the early '90s.
 - Has only now become popular enough for vendors to mass-produce.
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From CRT to LCD

- CRT
 - Bulky, heavy, use vacuum tube technology.
 - Using technology that was developed in the 19th century.
- LCD
 - First LCD laptop monitors were very small due to manufacturing costs.
 - Light, sleek, energy-efficient, have sharp picture.




How Monitors Work

- Most use a cathode-ray tube as a display device.
- CRT: Glass tube that is narrow at one end and opens to a flat screen at the other end.
- Narrow end contains electron guns.
 - Single gun for monochrome and three guns for color.
 - Display screen is covered with tiny phosphor dots that emit light when struck by the electron gun.





Monitor Classifications

- **Monochrome:** Display two colors, one for the background and one for the foreground.
 - **Gray-Scale:** A special type of monochrome monitor capable of displaying different shades of gray.
 - **Color:** Can display anywhere from 16 to over 1 million different colors. Sometimes called RGB monitors.
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Monitor Quality and Resolution

Quality:


- Manufacturers describe quality by dot pitch.
- Smaller dot pitches mean pixels are closely spaced which will yield a sharper image.
- Most monitors have dot pitches that range from 0.22mm to 0.39mm.

Resolution:

- Indicates how densely packed the pixels are.
- Most modern monitors can display 1024x768 pixels.
- High end models can display 1280x1024.




LCD Technology

- Used for displays in notebooks, small computers, pagers, phones and other instruments.
 - Uses a combination of fluorescent-based backlight, color filters, transistors, and liquid crystal to create and illuminate images.
 - Until recently, was only used on notebook computers and other portable devices.
 - In 1997, manufactures began to offer full size LCD monitors as alternatives to CRT monitors.
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IBM Advances in Display Technology

- In 1981, IBM introduced the Color Graphics Adapter (CGA) display, able to display 4 colors and max resolution of 320x200.
 - In 1984, Enhanced Graphics Adapter (EGA) display, able to display 16 colors and resolution of 640x350.
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IBM Advances in Display Technology (cont.)

- In 1987, Video Graphics Array (VGA) display.
 - ▣ Most computers today support the VGA standard.
 - In 1990, Extended Graphics Array (XGA) display, capable of resolutions 800x600 in true color (16.8 million colors) and 1024x768 in 65,536 colors.
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Windows Screen Shots Throughout Time:

MS-DOS

Microsoft SMARTDrive Disk Cache version 4.0
Copyright 1991,1992 Microsoft Corp.

Cache size: 1,048,576 bytes
Cache size while running Windows: 131,072 bytes

Disk Caching Status			
drive	read cache	write cache	buffering
A:	yes	no	no
B:	yes	no	no
C:	yes	no	no

For help, type "Smartdrv /?".

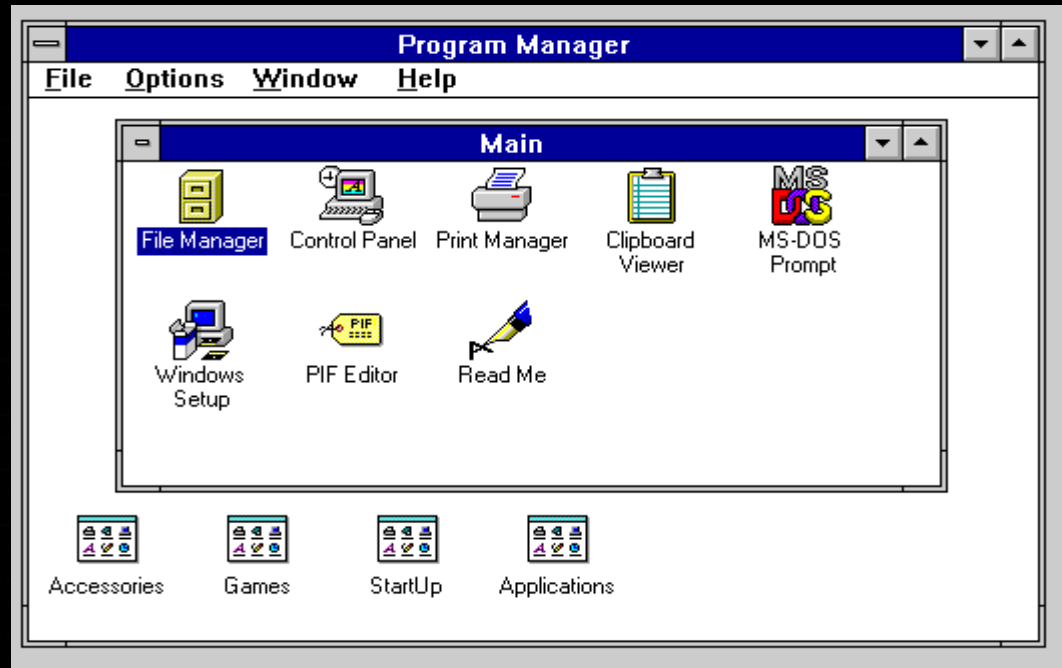
The memory-resident portion of SMARTDrive is loaded.
SoftWindows Mouse 4.01 installed

COM1: 9600,n,8,1,-

MS-DOS Version 6.22

Type WIN and press RETURN to start Windows.
C:\>_

Windows 3.1



Windows Screen Shots Throughout Time:

Windows 98



Windows Screen Shots Throughout Time:



Advantages of LCDs

- Physical Size
 - Compact and Lightweight
 - Space saving
 - Can be mounted on a wall or panel



Advantages of LCDs

- Display Size

- Available at comparable in screen size as traditional CRT
- Shown on the next slide, a 12.1" LCD display (left) has only a slightly smaller viewing area than a typical 14" CRT monitor. Newer, larger LCD monitors are also appearing that have 15", 17", and even larger screen sizes that are comparable to the largest CRT monitors. (One thing to note is that LCD monitors are typically sized by their actual viewable diagonal measurement, but CRTs typically are not.)

Advantages of LCDs



Advantages of LCDs

- Power Consumption and Radiation Emission
 - Consume less energy and more durable
 - A typical CRT losses approximately 50% of its brightness after 10,000 hours. An LCD bulb will maintain its brightness anywhere from 25,000 to 50,000 hours.
 - LCD consumes fewer watts than a CRT. LCD will use an average 30 watts compared to 120 watts for the CRT.
 - Can reduce electric bill by 40-85%.
 - Uses a combination of fluorescent-based backlight, color filters, transistors, and liquid crystal to create and illuminate images. It blocks light rather emit light



Advantages of LCDs

- Power Consumption and Radiation Emission
 - Does not emit Radiation
 - Not subject to Electromagnetic Interference


Advantages of LCDs

- Viewing
 - Cause less eyestrain
 - Does not flicker or glare

(Source: Dailey News – June 2, 2002, TouchScreens.com, unicomplabs.com, TheVisualLink.com)



Advantages of CRT

- Color
 - Most are capable of displaying unlimited colors.
 - Resolution
 - Multiple video Resolutions.
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Advantages of CRT

- Response Time
 - Faster response time. Critical to people who watch videos or play games on their PC's.
 - The fastest LCD's offer a response time of about 25 milliseconds as apposed to CRT's that have a response time of about 13 milliseconds.

Advantages of CRT

- Viewing Angle
 - ▣ Look @ a very wide angle

Larger Viewing Angle



Smaller Viewing Angle



(Source: PCWorld.com, TouchScreens.com)

Disadvantages of LCDs

- Resolution

- Displays Native Resolutions (Resolution that it displays best)

- Viewing Angle

- Smaller, needed to be viewed more directly from the front.
- From the side the images on an LCD screen can seem to disappear, or invert colors.
- Newer displays that are coming out have a wider viewing angle so this is not as much of an issue as it has been in the past.

Disadvantages of LCDs

- Price

- Upfront cost it is more costly but long-term cost but will conserve energy in the long run.
- The energy savings may not be much for an individual use, but for a corporate office where 50 displays or more are in use, the energy savings might be more of an issue.

Disadvantages of LCDs

- Installation
 - Need a plug interface to connect to the computer.
 - Some require a special digital plug-interface in order to work .
 - Problem: is that this plug is not available on most computers, so another video card or adapter must be purchased to plug these LCD monitors into the computer.

Disadvantages of LCDs

- Response Time
 - It is much slower. The delay can cause a ghosting effect on images it displays.

(Source: TechRepublic.com, PCWorld.com, TouchScreens.com)

Disadvantages of CRTs

- Physical size
 - Takes more desktop space.

(Source: TechRepublic.com)

Disadvantages of CRTs

- Power Consumption and Radiation Emission
 - Consumes more energy
 - Emits harmful radiation. The metal shield behind the glass of your monitor protects your body from a flood of radiation.
 - It holds a dangerous electrical charge even after turned off and can last up to several years and be hazardous and even deadly to anyone who opens a CRT monitor casing.
 - Known to cause fires due to electrical malfunctions and excessive heat if the ventilation holes are accidentally covered up.

(Source: TechRepublic.com)




CURRENT LCD'S

Current Technology and Trends






Business Aspect

1. Reasons for a sensitive market:
 - I. Price sensitive demand – As price drops slightly sales go up sharply.
 - II. Long time for production facilities to form.
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Recent History

- 1999 – Very high demand for LCD
 - 2000 – Crash of computer market causes surplus.
 - Prices are slashed.
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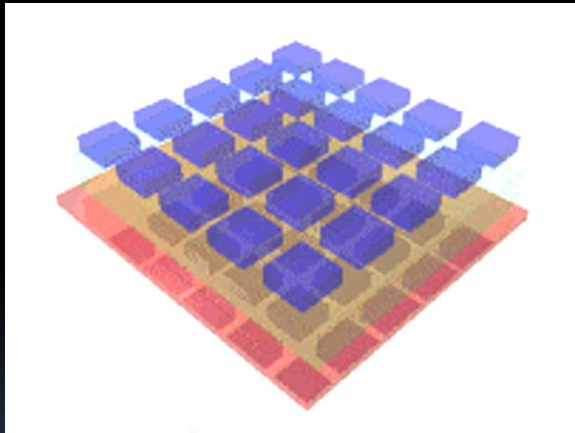


Technology Aspect

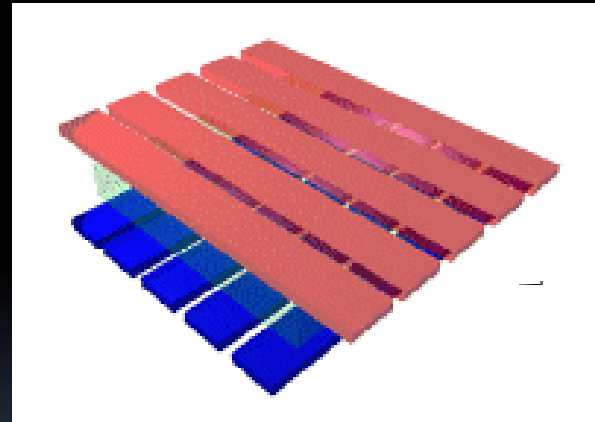
- 1. Display addressing.
 - 2. Analog VS digital signal handling.
 - 3. Display Uniformity .
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Active VS. Passive Display

Active Display



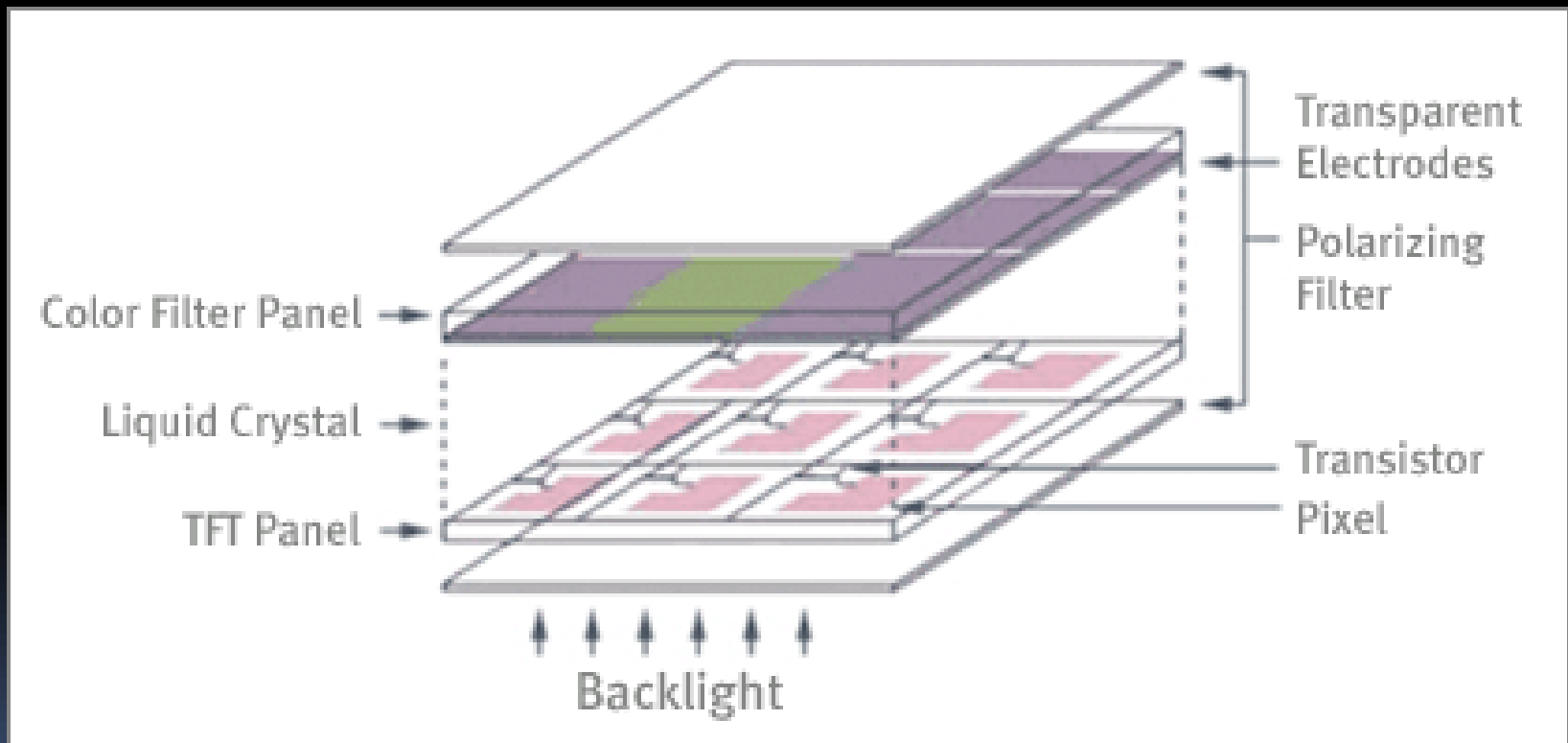
Passive Display



Active Display

- Active-matrix LCDs depend on thin film transistors (TFT).
- TFTs are tiny switching transistors and capacitors.
- They are arranged in a matrix on a glass substrate.
- To address a particular pixel, the proper row is switched on, and then a charge is sent down the correct column.
- Since all of the other rows that the column intersects are turned off, only the capacitor at the designated pixel receives a charge.
- The capacitor is able to hold the charge until the next refresh cycle.

TFT (Thin Film Transistor)




Passive Display

- Passive-matrix LCDs use a simple grid to supply the charge to a particular pixel on the display.
- The rows or columns are connected to integrated circuits that control when a charge is sent down a particular column or row.
- A polarizing film is added to the outer side of each substrate.
- To turn on a pixel, the integrated circuit sends a charge down the correct column of one substrate and a ground activated on the correct row of the other.
- The row and column intersect at the designated pixel, and that delivers the voltage to untwist the liquid crystals at that pixel.




Analog VS Digital signal handling

- On most graphic card signal goes through DAC (digital to analog converter) to convert to Analog signal.
 - LCD must convert the signal back to digital to determine which pixel to light.
 - If conversion has error the result is "pixel jitter", in which the image seems to shimmer or move.
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Improved Signal Handling

- 1. DVI (digital video interface) standard was adopted.
 - i. DVI handles both analog and digital signals with separate connectors
 - 2. controlling circuitry became substantially better in a very short time.
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Display Uniformity

Backlight

- Early LCD backlight wasn't uniform and "hot spots" were created.
 - Display manufacturers developed more sophisticated diffusing materials.
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Conclusion

